

Place • Measure • Improve

Mantec Technical Ceramics is a prime innovator in its field and, with many decades of experience to support its research efforts, has successfully developed Bullers™ Process Control Discs (BPCDs) as the new generation of pyrometric measuring devices. The globally renowned Bullers™ pyrometric devices have been manufactured in the UK for over 100 years and Mantec’s experience in the field is second to none.

World Class Manufacturing Techniques

BPCDs are used to measure ‘Heat Work’, the total effect of the heat energy on the product being fired. At Mantec we employ world-class manufacturing techniques to produce our discs to a precise materials specification. Each and every batch of raw materials in our factory is pre-tested to exacting standards before being released into our sophisticated ISO 9001:2008 accredited manufacturing process.

The BPCDs have been designed so that they are suitable for any type of kiln/furnace and due to their practical size can be conveniently positioned in almost any location. There are five different types of BPCDs, all 20mm in diameter, 3.5mm thickness, covering very low temperatures (VLT-770°C) to very high temperatures (VHT-1770°C).

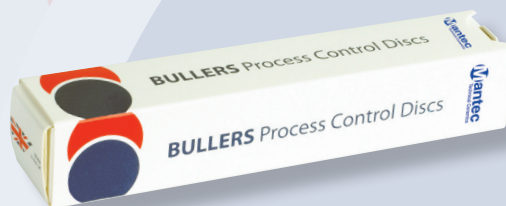
These five ranges have overlapping operating parameters and we believe they are the most flexible and cost efficient devices available today.

What are BPCDs?

BPCDs are specially formulated ceramics with closely defined specifications. They operate within a full range of temperatures from 770°C up to 1770°C. They provide the basic information needed to maintain consistent, accurately controlled and reproducible firing conditions.

BPCDs are therefore an essential part of any Quality Assurance System involving the firing of ceramic products. The most common applications for our current product range are in the firing of:

- Technical Ceramics
- Single & Multi-layer Capacitors
- Insulators
- Ferrites
- Refractories
- Grinding Wheels
- Tableware
- Sanitaryware
- Wall/Floor Tiles
- Bricks & Roof Tiles



Standard Range of Bullers™ Process Control Discs

| Temperature Range | | Product Code |
|-----------------------|-----------------|--------------|
| Very Low Temperature | 770°C – 950°C | BPCD-VLT3.5 |
| Low Temperature | 900°C – 1150°C | BPCD-LT3.5 |
| Medium Temperature | 1050°C – 1320°C | BPCD-MT3.5 |
| High Temperature | 1250°C – 1550°C | BPCD-HT3.5 |
| Very High Temperature | 1500°C – 1770°C | BPCD-VHT3.5 |

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Why are BPCDs used?

There are of course other measurements being provided to the kiln manager on a constant basis via the kiln control system. More often than not these are zonal temperatures and do not tell the whole story. These readings are extremely accurate and up-to-the-minute but are purely temperature readings rather than an indication of total Heat Work.

Thermocouples are also regularly used in sintering/firing plants. However, thermocouple measurements are by their very nature only local, whereas BPCDs – like the payload they sit alongside – are ceramic, of a known composition, and make the same ‘thermal journey’.

Only the use of a set of carefully placed BPCDs can lead to reliable kiln firing mapping, which ultimately provides the information needed to establish the optimum firing regime for each product type and firing cycle.

Kiln loads usually involve a large amount of product, meaning that even marginal variations from optimal firing can adversely affect finished product quality and can therefore damage profits. Our BPCDs help managers to make those slight – but vital – adjustments before this becomes the case. Regular use of BPCDs will alert the kiln manager to the onset of a fault developing in a particular area of the firing zone. Adjustments can be made and/or problems fixed before they adversely affect fired product quality. This saves time and money.

Finally, BPCDs are also a vital tool in maintaining conformity with Quality Assurance standards. Manufacturers have benchmarked against our Bullers™ pyrometric devices for over 100 years.



What is ‘Heat Work’?

Heat Work is the action and effect of temperature over time on a product, often referred to as Heat Energy. Simply put, it is a defined measurement of the total heat energy effect on a product while in production. BPCDs allow you to understand the effect that variations in temperature, rate of firing and length of soaking time have on the product and what action is required to prevent costly production problems occurring on future firings.

They can be used to increase your yields and early notification of under-fired products allow you to re-fire to the correct quality, saving scrap products while maintaining capacity and profitability. Only Heat Work measuring and monitoring will allow you to understand what has happened to the product in the kiln independently of time and temperature.

How are BPCDs used?

BPCDs can be placed across a number of locations (ideally) in all types of kiln, furnace or similar laboratory and full production sintering systems. Positions will vary, especially between continuous and intermittent processes, but the aim is to pick up an accurate picture of overall heat distribution.

One of the key features offered by the BPCDs is transferability. Information and optimum firing regimes can be extrapolated from laboratory trials to full production kilns.



Step-by-Step Guide to the Bullers™ System

Step 1 Selection

Select the most appropriate BPCD, whose central temperature spread is nearest to your kiln's peak firing temperature.

Remove the BPCDs from the tubes and record the batch number that is clearly displayed on the outer packaging for future reference.

Step 2 Positioning

Position the BPCDs in a number of different locations throughout the kiln and alongside the product to be fired in accordance with a pre-determined plan. This ensures that 'Heat Work' is monitored throughout the whole of the kiln.

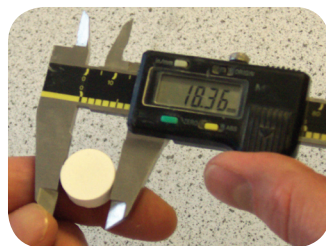
Mark the BPCDs in relation to their position in the kiln and detail this on to your kiln record sheet.

Step 3 Measuring

Once the kiln firing has taken place and the BPCDs have reached ambient temperature, remove them from the kiln car.

Determine the amount of BPCD shrinkage by measuring the external diameter of the BPCDs using either a BPCD Gauge or Vernier calipers. Ensure the measurement is taken from around the centre of the diameter of the BPCD in order to avoid measurement errors.

Record the BPCD diameter to two decimal places on to the kiln record sheet against the position in which it was placed inside the kiln.



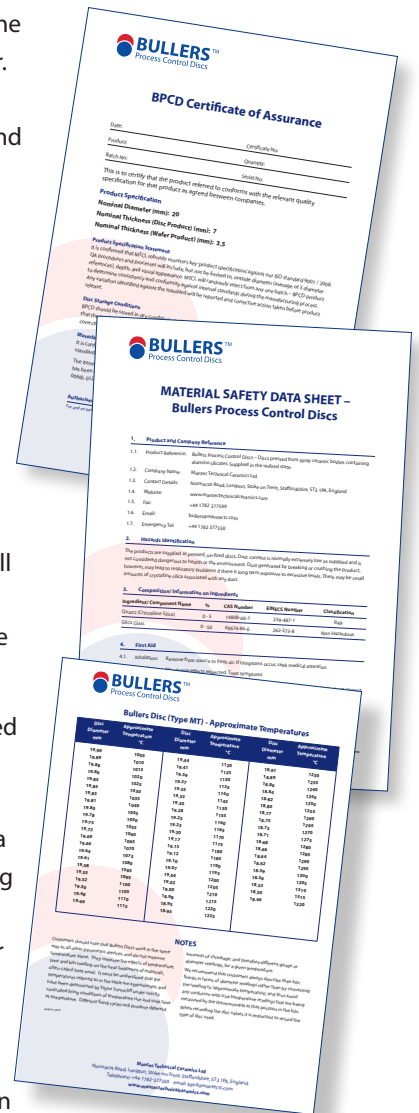
Step 4 Disc Temperature Conversion

The standard Temperature Correlation Charts, provided in every box, can be used to determine 'Disc Temperature' from the measured BPCD diameter. The conversion to 'Disc Temperature' is an easy and useful way to compare against historical results.

The manufacturing of BPCDs is very tightly controlled so only one set of Temperature Correlation Charts is ever needed for each BPCD type. The same charts can therefore be used time and again for all production batches, thus avoiding the need to have multiple charts.

'Disc Temperature' referred to in the Temperature Correlation Charts is only approximate and acts as a guide to a kiln's peak firing temperature. As BPCDs react to 'Heat Work' rather than temperature alone, 'Disc Temperature' is therefore not necessarily the same as the actual kiln temperature, as measured by a thermocouple.

Due to differing firing rates, air flow, kiln loadings and kiln atmospheres, the actual performance of BPCDs when used by the customer may be different from the Temperature Correlation Charts, which Mantec Technical Ceramics have determined under strictly controlled firing conditions.



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Step 5 Comparing

BPCD results should be compared against historical data, where acceptable results and norms have been determined for each BPCD type and product fired.

If BPCDs are being used for the first time, an acceptable BPCD result – based on Disc Diameter and the quality of the fired product – needs to be determined over a number of firings. This result should then be recorded for comparison against future firings (the standard).

Any BPCD results that deviate significantly from the accepted standards will highlight very quickly to the kiln operator that corrective action may be required to ensure the correct product quality.

Step 6 Calibration

Once you receive a new batch of BPCDs, it is necessary to calibrate them against your existing batch under your own firing conditions.

By calibrating different BPCD batches, you are able to maintain meaningful records of your kiln performance over days, weeks, months and years.

For further information on calibration, please refer to our website.

www.mantectechnicalceramics.com



Giving You the Edge

BPCDs can also be used to effectively set up new or refurbished kilns and also new types of product.

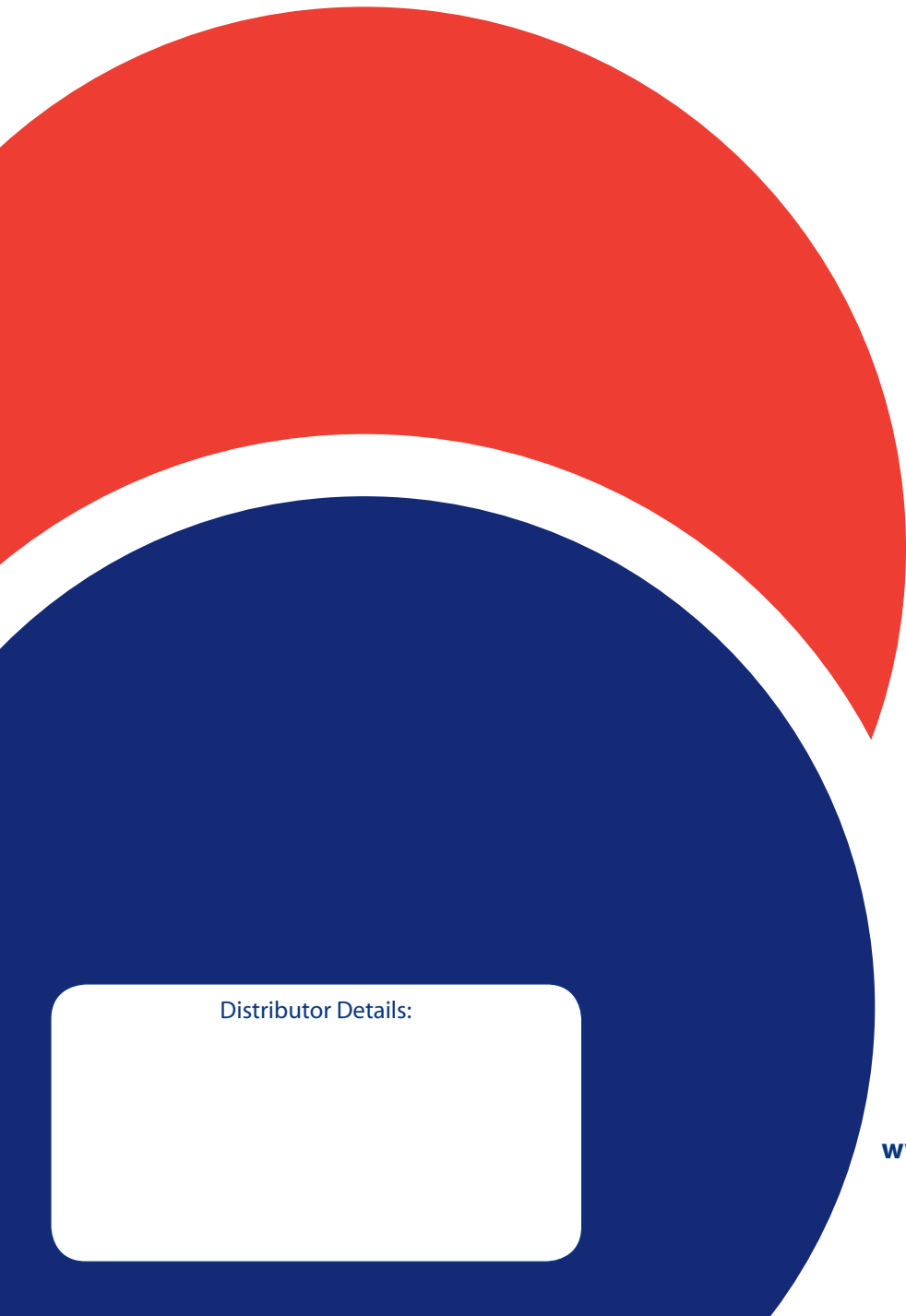
All in all, BPCDs offer a rapid and low-cost method of mapping Heat Work and Heat Energy within a kiln/furnace. It only requires a relatively short time to measure and record the BPCD data.

Heat Work conditions in any firing/sintering situation must be uniform, measurable and reproducible – and BPCDs are by far and away the most cost efficient, consistent, reliable and user friendly solution.

BPCDs are manufactured in the UK under strictly monitored conditions, are small and lightweight and are conveniently packaged and easily stored.

Speak to our specialist team today and get peace of mind and profit protection.





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